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3.2 Measurement of Non-linearity in Optical Interferometers3.3 Combined Optical and X-ray Interferometry; 3.4 Measurement of Small Angles; 3.5 X-ray Interferometry and Scanning Probe Microscopy; 3.6 Conclusions; References; Part II Instrumentation - Long-range Scanning Probe Microscopes; 4 Advances in Traceable Nanometrology with the Nanopositioning and Nanomeasuring Machine; 4.1 Introduction; 4.2 Design and Operation; 4.3 Uncertainty Budget; 4.4 Focus Sensor; 4.5 Measuring Opportunities and Performance with Focus Sensor; 4.6 Focus Probe with SFM Cantilever; 4.7 Conclusion; Acknowledgements References5 Coordinate Measurements in Microsystems by Using AFM-Probing: Problems and Solutions; 5.1 Introduction; 5.2 Realizing CMMs for Microsystems; 5.3 Problems and Solutions; 5.3.1 Dynamics of Positioning System; 5.3.2 CMM: One-Millimeter Scan; 5.3.3 Measuring Strategies; 5.4 Conclusion and Outlook; References; 6 Metrological Large Range Scanning Force Microscope Applicable for Traceable Calibration of Surface Textures; 6.1 Introduction; 6.2 Instrumentation; 6.2.1 Principle; 6.2.2 Metrological Properties; 6.2.3 Traceability; 6.2.4 Specially Designed Features
6.3 Measurement Result of a 2D-Grating Standard6.3.1 Measurement Strategy; 6.3.2 Data Evaluation; 6.3.3 Measurement Result of the Mean Pitch Value; 6.3.4 Measurement of the Local Pitch Variation; 6.4 A Selected Measurement Result of a Microroughness Standard; 6.4.1 Measurement Result of a Glass Flatness Standard; 6.4.2 Measurement of a PTB Microroughness Standard; 6.4.3 Comparison of the Roughness Measurement Results Derived from SFM and Stylus Instruments Using Gaussian Filter; 6.4.4 Comparison Using Morphological Filters; 6.4.5 Evaluation Results Using PTB Reference Software
6.5 Outlook and Conclusion

Sommario/riassunto

The quantitative determination of the properties of micro- and nanostructures is essential in research and development. It is also a prerequisite in process control and quality assurance in industry. The knowledge of the geometrical dimensions of structures in most cases is the base, to which other physical and chemical properties are linked. Quantitative measurements require reliable and stable instruments, suitable measurement procedures as well as appropriate calibration artefacts and methods. The seminar ""NanoScale 2004"" (6th Seminar on Quantitative Microscopy and 2nd Seminar on Nanoscal